

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims

1. (currently amended): O-glycan α 2,8-sialyltransferase, ~~which is characterized in that it has the following~~ having substrate specificity and substrate selectivity,[[.]]
wherein the enzyme has substrate specificity wherein ~~Substrate specificity:~~ the substrates of the enzyme are glycoconjugates having a Sia α 2,3(6)Gal structure wherein Sia represents sialic acid and Gal represents galactose at the terminus thereof[[.]]; and
wherein the enzyme has substrate selectivity wherein ~~Substrate selectivity:~~ the enzyme incorporates sialic acids into O-glycans more preferentially than into glycolipids or N-glycans.

2. (original): O-glycan α 2,8-sialyltransferase having either one of the following amino acid sequences:

(1) an amino acid sequence shown in SEQ ID NO: 1 or 3; or

(2) an amino acid sequence comprising a deletion, substitution, and/or addition of one or several amino acids with respect to the amino acid sequence shown in SEQ ID NO: 1 or 3, and having O-glycan α 2,8-sialyltransferase activity.

3. (original): O-glycan α 2,8-sialyltransferase gene encoding the amino acid sequence of the O-glycan α 2,8-sialyltransferase according to claim 2.

4. (original): The O-glycan α 2,8-sialyltransferase gene according to claim 3 which has any one of the following nucleotide sequences:

(1) a nucleotide sequence corresponding to a portion between nucleotide 77 and nucleotide 1270 of a nucleotide sequence shown in SEQ ID NO: 2;

(2) a nucleotide sequence comprising a deletion, substitution, and/or addition of one or several nucleotides with respect to the nucleotide sequence corresponding to a portion between nucleotide 77 and nucleotide 1270 of the nucleotide sequence shown in SEQ ID NO: 2, and encoding a protein having O-glycan α 2,8-sialyltransferase activity;

(3) a nucleotide sequence corresponding to a portion between nucleotide 92 and nucleotide 1285 of a nucleotide sequence shown in SEQ ID NO: 4; and

(4) a nucleotide sequence comprising a deletion, substitution, and/or addition of one or several nucleotides with respect to the nucleotide sequence corresponding to a portion between nucleotide 92 and nucleotide 1285 of the nucleotide sequence shown in SEQ ID NO: 4, and encoding a protein having O-glycan α 2,8-sialyltransferase activity.

5. (currently amended): A recombinant vector comprising the O-glycan α 2,8-sialyltransferase gene according to claim 3 or 4.

6. (original): The recombinant vector according to claim 5 which is an expression vector.
7. (currently amended): A transformant transformed with the recombinant vector according to claim 5-or-6.
8. (currently amended): A method for producing O-glycan α 2,8-sialyltransferase ~~the enzyme according to claim 1 or 2~~ wherein the transformant of claim 7 is cultured and ~~the enzyme of claim 1 or 2~~ O-glycan α 2,8-sialyltransferase is collected from the culture.
9. (original): A protein which comprises an active domain of O-glycan α 2,8-sialyltransferase having any one of the following amino acid sequences:
- (1) an amino acid sequence corresponding to a portion between positions 26 and 398 of the amino acid sequence shown in SEQ ID NO: 1;
 - (2) an amino acid sequence comprising a deletion, substitution, and/or addition of one or several amino acids with respect to the amino acid sequence corresponding to a portion between positions 26 and 398 of the amino acid sequence shown in SEQ ID NO: 1, and having O-glycan α 2,8-sialyltransferase activity;
 - (3) an amino acid sequence corresponding to a portion between positions 68 and 398 of the amino acid sequence shown in SEQ ID NO: 3; and

(4) an amino acid sequence comprising a deletion, substitution, and/or addition of one or several amino acids with respect to the amino acid sequence corresponding to a portion between positions 68 and 398 of the amino acid sequence shown in SEQ ID NO: 3, and having O-glycan α 2,8-sialyltransferase activity.

10. (currently amended): An extracellular secretory protein, ~~which comprises~~ comprising a polypeptide portion which is an active domain of the O-glycan α 2,8-sialyltransferase of claim 1 ~~or~~ 2, and a signal peptide, and has O-glycan α 2,8-sialyltransferase activity.

11. (currently amended): A gene encoding the protein according to claim 9 ~~or~~ 40.

12. (original): A recombinant vector comprising the gene according to claim 11.

13. (original): The recombinant vector according to claim 12 which is an expression vector.

14. (currently amended): A transformant transformed with the recombinant vector according to claim 12 ~~or~~ 13.

15. (currently amended): A method for producing the a protein according to ~~claim 9 or 10~~ comprising an active domain of O-glycan α 2,8-sialyltransferase wherein the transformant of claim 14 is cultured and the protein of ~~claim 9 or 10~~ is collected from the culture.

16. (currently amended): β -galactoside α 2,6-sialyltransferase, ~~which is characterized in that it has the following~~ having activity ~~action~~ and substrate specificity₁[[.]]

~~(1) Action;~~

wherein the activity comprises ~~The enzyme transfer~~[[s]] of sialic acid through an α 2,6 linkage into the galactose portion of a sugar chain having a galactose β 1,4N-acetylglucosamine structure at the terminus thereof[[.]]; and

~~(2) Substrate specificity~~

wherein the enzyme has substrate specificity wherein the ~~The~~ substrate of the enzyme is a sugar chain having a galactose β 1,4N-acetylglucosamine structure at the terminus thereof, and lactose and a sugar chain having a galactose β 1,3N-acetylglucosamine structure at the terminus thereof are not the substrate of the enzyme.

17. (original): β -galactoside α 2,6-sialyltransferase having either one of the following amino acids:

- (1) an amino acid sequence shown in SEQ ID NO: 5 or 7; or
- (2) an amino acid sequence comprising a deletion, substitution, and/or addition of one or several amino acids with respect to the amino acid sequence shown in SEQ ID NO: 5 or 7, and having β -galactoside α 2,6-sialyltransferase activity.

18. (original): A β -galactoside α 2,6-sialyltransferase gene encoding the amino acid sequence of the β -galactoside α 2,6-sialyltransferase according to claim 17.

19. (original): The β -galactoside α 2,6-sialyltransferase gene according to claim 18 which has any one of the following nucleotide sequences:

- (1) a nucleotide sequence corresponding to a portion between nucleotide 176 and nucleotide 1762 of a nucleotide sequence shown in SEQ ID NO: 6;
- (2) a nucleotide sequence comprising a deletion, substitution, and/or addition of one or several nucleotides with respect to the nucleotide sequence corresponding to a portion between nucleotide 176 and nucleotide 1762 of the nucleotide sequence shown in SEQ ID NO: 6, and encoding a protein having β -galactoside α 2,6-sialyltransferase activity;
- (3) a nucleotide sequence corresponding to a portion between nucleotide 3 and nucleotide 1574 of a nucleotide sequence shown in SEQ ID NO: 8; and
- (4) a nucleotide sequence comprising a deletion, substitution, and/or addition of one or several nucleotides with respect to the nucleotide sequence corresponding to a portion

between nucleotide 3 and nucleotide 1574 of the nucleotide sequence shown in SEQ ID NO: 8, and encoding a protein having β -galactoside α 2,6-sialyltransferase activity.

20. (currently amended): A recombinant vector comprising the β -galactoside α 2,6-sialyltransferase gene according to claim 18-~~or 19~~.

21. (original): The recombinant vector accrding to claim 20 which is an expression vector.\

22. (currently amended): A transformant transformed with the recombinant vector according to claim 20-~~or 24~~.

23. (currently amended): A method for producing ~~the enzyme according to claim 16 or 17~~, β -galactoside α 2,6-sialyltransferase wherein the transformant of claim 22 is cultured and ~~the enzyme of claim 16 or 17~~ β -galactoside α 2,6-sialyltransferase is collected from the culture.

24. (original): A protein comprising an active domain of β -galactoside α 2,6-sialyltransferase having any one of the following amino acid sequences:

(1) an amino acid sequence corresponding to a portion between positions 33 and 529 of the amino acid sequence shown in SEQ ID NO: 5;

(2) an amino acid sequence comprising a deletion, substitution, and/or addition of one or several amino acids with respect to the amino acid sequence corresponding to a portion between positions 33 and 529 of the amino acid sequence shown in SEQ ID NO: 5, and having β -galactoside α 2,6-sialyltransferase activity;

(3) an amino acid sequence corresponding to a portion between positions 31 and 524 of the amino acid sequence shown in SEQ ID NO: 7; and

(4) an amino acid sequence comprising a deletion, substitution, and/or addition of one or several amino acids with respect to the amino acid sequence corresponding to a portion between positions 31 and 524 of the amino acid sequence shown in SEQ ID NO: 7, and having β -galactoside α 2,6-sialyltransferase activity.

25. (currently amended): An extracellular secretory protein, which comprises a polypeptide portion which is an active domain of the β -galactoside α 2,6-sialyltransferase according to claim 16 ~~or 17~~, and a signal peptide, and has β -galactoside α 2,6-sialyltransferase activity.

26. (currently amended): A gene encoding the protein according to claim 24 ~~or~~ 25.

27. (original): A recombinant vector comprising the gene according to claim 26.

28. (original): The recombinant vector according to claim 27 which is an expression vector.

29. (currently amended): A transformant transformed with the recombinant vector according to claim 27 ~~or 28~~.

30. (currently amended) A method for producing ~~the protein according to claim 24 or 25~~ a protein comprising an active domain of β -galactoside α 2,6-sialyltransferase wherein the transformant of claim 29 is cultured and the protein ~~of claim 24 or 25~~ is collected from the culture.